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Verification of high resolution simulation of precipitation and wind in Portugal

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Demand of energy and freshwater continues to grow as the global population and demands increase. Precipitation feed the freshwater ecosystems which provides a wealth of goods and services for society and river flow to sustain native species and natural ecosystem functions. The adoption of the wind and hydro-electric power supplies will sustain energy demands/services without restricting the economic growth and accelerated policies scenarios. However, the international meteorological observation network is not sufficiently dense to directly support high resolution climatic research. In this sense, coupled global and regional atmospheric models constitute the most appropriate physical and numerical tool for weather forecasting and downscaling in high resolution grids with the capacity to solve problems resulting from the lack of observed data and measuring errors.
Thus, this study aims to calibrate and validate of the WRF regional model from precipitation and wind fields simulation, in high spatial resolution grid cover in Portugal. The simulations were performed in two-way nesting with three grids of increasing resolution (60 km, 20 km and 5 km) and the model performance assessed for the summer and winter months (January and July), using input variables from two different reanalyses and forecasted databases (ERA-Interim and NCEP-FNL) and different forcing schemes. The verification procedure included: (i) the use of several statistics error estimators, correlation based measures and relative errors descriptors; and, (ii) an observed dataset composed by time series of hourly precipitation, wind speed and direction provided by the Portuguese meteorological institute for a comprehensive set of weather stations. Main results suggested the good ability of the WRF to: (i) reproduce the spatial patterns of the mean and total observed fields; (ii) with relatively small values of bias and other errors; and, (iii) and good temporal correlation. These findings are in good agreements with the conclusions of other previous studies with WRF. It is also important to underline the relative independence of the simulations with the datasets used to feed the model and a relatively better performance with one of the tested forced scheme. These findings suggest the skill and robustness of the WRF to produce high resolution simulations of both precipitation and wind.

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